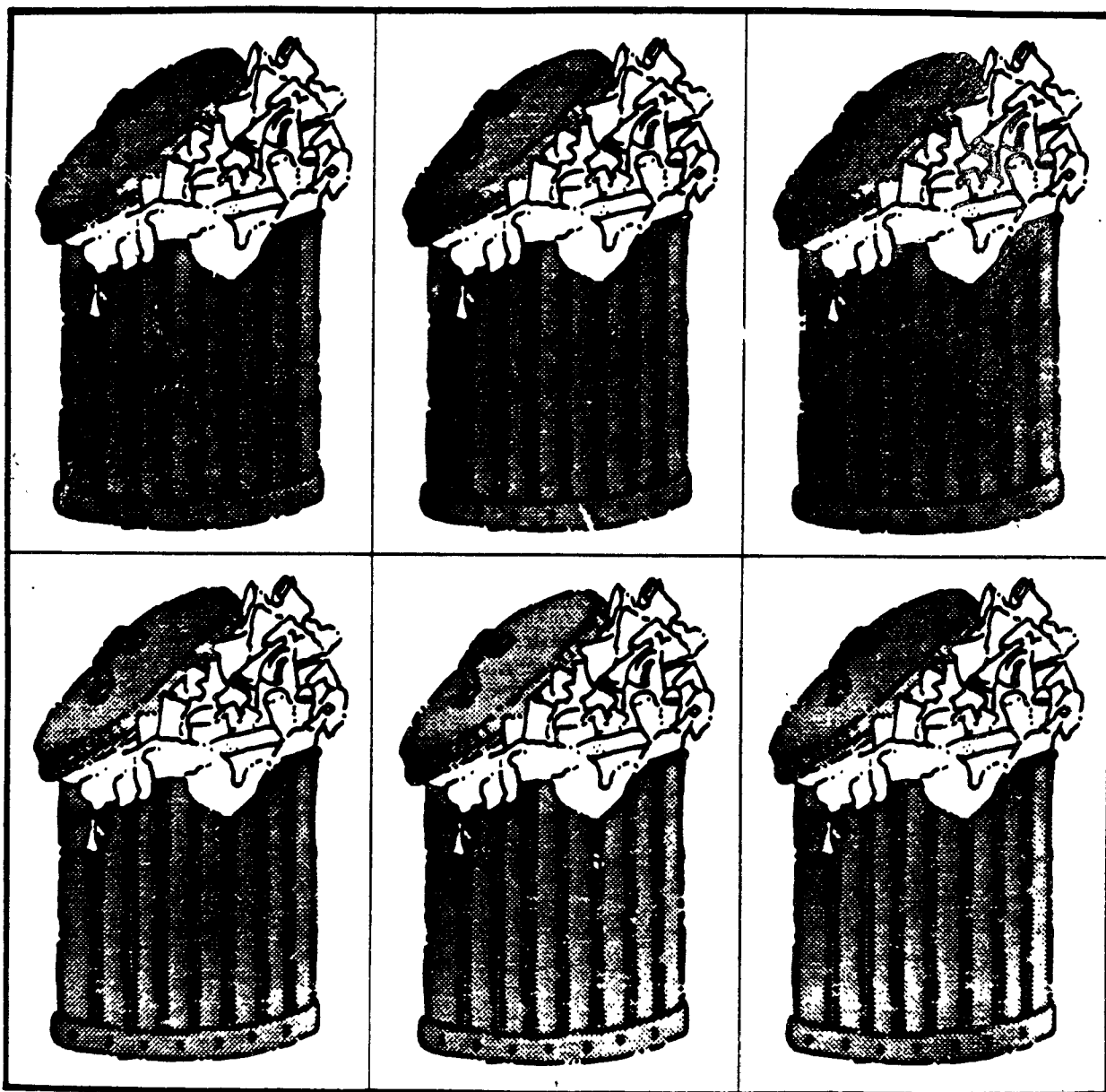




The Solid Waste Dilemma: An Agenda for Action



Draft Report
of the Municipal Solid Waste Task Force
Office of Solid Waste
United States Environmental Protection Agency
September 1988

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Americans relentlessly produce more and more solid waste each year; we generate more per capita than any other nation. For example, an American generates almost one pound per day more waste than his/her counterpart in West Germany. But, at the same time that we generate more waste, we are running out of places to dispose of it. Landfill capacity in some places is almost filled to the saturation point, and municipalities and private firms face growing public resistance as they attempt to site new landfills and build new incinerators. Public health and environmental concerns play a central role in public opposition. Even materials recovery facilities and recycling centers can be difficult to site, because many tend to associate all waste management operations with unpleasant smells, noise, and truck traffic. The feckless voyage of the "garbage barge" last year and the ash barges this year have become national symbols of America's solid waste dilemma.

Although solid waste management is primarily a local responsibility, the problem is national in scope, and we need a national strategy to solve it. In response to the recent rash of environmental and siting problems, EPA created a Municipal Solid Waste Task Force in February 1988 and directed it to fashion a strategy for improving the nation's management of municipal solid waste. The following report, developed in consultation with a variety of knowledgeable groups and individuals, presents the Task Force's draft Agenda for Action, which is being released for public comment.

The Agenda for Action offers a number of concrete suggestions for action by not only EPA, but also government at all levels, industry, and private citizens. This Agenda cannot be accomplished by the Federal government acting alone. Its accomplishment is contingent on a strong partnership between government, industry and the public. It also underscores the need for a fundamental change in the nation's approach to producing, packaging and disposing of consumer goods. In the past, "business as usual" meant an accelerating trend toward disposable products, con-

venience packaging, and an "out-of-sight, out-of-mind" attitude toward solid waste. As a nation, we can no longer afford this kind of "business as usual." We must adopt a new solid waste management ethic that minimizes the amount and toxicity of waste created by the products we make and purchase, produced during the manufacturing process, and generated by our day-to-day activities as consumers. That ethic must also maximize the amount of waste materials that are reused and recycled so that we minimize our reliance on landfills and incinerators. In short, we need to change the way we do business. This change will not be easy. We all must work diligently in the short term in order to make long-term changes. I hope this report will serve as a centerpiece for this change.

The draft Agenda for Action is being issued to stir debate, to elicit the views and concerns of all interested parties, and to work toward consensus on the problems and solutions for managing municipal solid waste. EPA will hold four public meetings in September and October, 1988 and will allow a 60-day period from the publication date of this document in which the public may submit written comments. A final document is planned for January, 1989. EPA is committed to working with all parties to resolve this serious national issue, and encourages government, industry and the public to form the partnership which is vital to developing solutions to these problems. I encourage each of you to review this document with a critical eye. These are difficult issues which demand the attention of all of us.



--J. Winston Porter

Assistant Administrator
Solid Waste and
Emergency Response

EXECUTIVE SUMMARY

This report is about what the government calls municipal solid waste, and almost everyone else calls garbage. As a nation, we generate about 160 million tons of solid waste a year. This report is about how we should handle this outflow of refuse - the cans, the bottles, the leaves and lawn clippings, the paper and plastic packages, the broken furniture and appliances, the uneaten food and the old tires. This deluge of garbage is growing steadily and we must find ways to manage it safely and effectively. We're running out of space to bury it in existing landfills; one third of the nation's landfills will be full within the next five years. Yet because of the Nimby syndrome and concerns over potential threats to human health and the environment, many cities are unable to find enough acceptable sites for new landfills or new incinerators.

This report presents the goals and recommendations for action by EPA, state and local government, industry and private citizens to address the municipal solid waste management problems that are facing this country. These goals and recommendations are the result of five months of study by EPA's recently created Municipal Solid Waste Task Force. The Task Force gathered existing data on municipal waste and problems regarding its management, solicited input from interested persons and groups, and developed a number of options to address these problems. This summary data is contained in a supplemental document titled "Background Document for the Solid Waste Dilemma: An Agenda for Action."

The types and extent of the problem in managing municipal solid waste vary from region to region depending on waste type, land use, and demographic characteristics, but some trends and problems are clearly national in scope. From 1960 to 1988, we generated more waste every year, both in total tonnage and in pounds per person, and this trend is expected to continue. In addition, we are running out of places to put our waste because old landfills are closing and few new landfills and incinerators are

able to be sited and built. There are concerns about potential threats to human health and the environment from incinerator emissions and ash, from landfill emissions, leachate, and litter. High costs are borne by the waste generator and handler, as many areas of the country resort to shipping waste long distances by truck and rail to areas with available landfill or incinerator capacity. Recycling, although a waste management technique popular with the public, is used currently to manage only 10 percent of the waste, and is successful only when participation in separation and collection is high and market prices for secondary materials are favorable. Finally, manufacturers of products have no direct incentive to design products for effective waste management because they are not usually directly responsible for the ultimate costs of waste management. Similarly, most consumers do not have a direct economic incentive to throw away less, because they are not usually charged based on the amount they throw away.

This report recommends using the hierarchy of "Integrated waste management" to solve municipal solid waste generation and management problems at the local, regional, and national levels. This hierarchy favors source reduction (including reuse) to first decrease the volume and toxicity and increase the useful life of products in order to reduce the volume and toxicity of waste. Recycling (including composting) is the preferred waste management option to further reduce potential risks to human health and the environment, divert waste from diminishing landfill and incinerator capacity, and slow the depletion of nonrenewable natural resources. Landfills and incinerators will be necessary for the foreseeable future to handle some wastes, but are lower on the hierarchy because of the potential risks to human health and the environment and long-term management costs. This risk potential can be largely minimized through proper design and management. Integrated waste management can and should be implemented at a local level to the extent practical, and is a useful conceptual tool for making management decisions. But, it is not meant to be rigidly applied when local unique waste and demographic characteristics make source reduction and recycling infeasible.

The integrated waste management hierarchy is the framework for the national goals presented in this report. This report presents EPA's stated goal of managing 25 percent of the municipal solid waste through source reduction and recycling by 1992. In addition, we must slow the rate of increasing waste generation which is projected for the Year 2000. We also must work to reduce the risks associated with landfills and incinerators inasmuch as these management alternatives will be necessary to handle at least some of the wastes in all communities. By implementing these goals, we can solve or reduce many of our municipal waste management problems.

This report outlines EPA's program to address these goals. It also presents a number of recommendations for State and local governments, industry, and consumers that will enable us to meet these goals. Information, assistance, and data must be made more accessible to everyone by generating catalogs of available materials, establishing a national clearinghouse, developing a "peer matching" program to allow all levels of government and waste management to exchange expertise, and developing a national research agenda for collecting new information and developing new technologies.

Planning at all levels of government is recommended in the report. EPA will hold national and regional planning conferences to facilitate the exchange of information. This report contains a list of elements that State and local municipal solid waste management plans should include.

Source reduction should be fostered at the manufacturing, governmental, and local levels. EPA will study options for reducing lead and cadmium in products in order to reduce the risks of incinerator ash, landfill leachate, and recycling operations. EPA will foster workshops for manufacturers and educators to promote the design of products and packaging for effective waste management. EPA will identify economic, regulatory and possibly legislative incentives for decreasing the volume and toxicity of waste. EPA will also take steps to facilitate Federal procurement of products with

source reduction attributes. Industry should conduct waste audits, and determine ways to decrease the volume and toxicity of materials used in manufacture.

Recommendations for recycling include fostering implementation of existing Federal procurement guidelines (as well as evaluating ones for additional commodities), and creating an interagency working group to develop pilot and full-scale projects for separating recyclables in Federal agencies. Markets for secondary materials and recycled goods must be stimulated and stabilized; thus EPA will conduct market development studies for different commodities, will examine economic and regulatory incentives for using secondary or recycled materials, and will foster the formation of regional marketing councils for the exchange of market information. A National Recycling Council will be formed with members from all sectors of waste management to track recycling issues and problems and to recommend actions. Finally, EPA will study how to foster recycling lead-acid batteries, including examining the current incentives and disincentives associated with liability. Industry should step up its efforts in fostering the recycling of plastics. State and local governments should encourage separation of recyclables, conduct waste exchanges, and provide incentives for stable markets for recycled goods.

Finally, recommendations for decreasing the risks from landfilling and incineration include continuing EPA's ongoing efforts for performance standards for new incinerators, guidelines for existing ones, air emission standards for landfills, and revised minimum design and operation criteria for landfills. EPA recommends that ash management plans be developed as part of any plan for incineration of waste. EPA, in conjunction with trade associations, will facilitate development of guidance on training and certification for incinerator and landfill operators. EPA will also study whether bans are necessary or desirable for certain types of waste. Finally, EPA will develop a primer on risk assessments for incineration and landfilling to inform the public on general risk assessment methods and limitations.

These recommendations present a core program for governmental, industrial and citizen action which will help solve our nation's municipal waste management problems and are being presented for public comments. A final report is expected in January 1989.

INTRODUCTION

This report is about what the government calls municipal solid waste and almost everybody else calls garbage. It's about soft drink bottles, cans, disposable diapers, uneaten food, scraps of wood and metal, worn-out tires and used-up batteries, paper and plastic packages, boxes, broken furniture and appliances, clippings from our lawns and shrubs--the varied human refuse of our modern industrial society.

All of us generate solid waste every day--a total for the nation of about 160 million tons a year. And the garbage deluge is growing steadily; with our current garbage practices, it could reach 193 million tons by the Year 2000. More than 40 percent of this solid waste stream consists of the paper and paper products we discard in our homes, offices and factories.* Yard wastes make up another 18 percent of the total. The other major components are metals, glass, food waste, and plastics (see Figure 1). Symptomatic of what social critics call our "throwaway society" are the many disposable products that are manufactured, imported, sold, used and thrown away; for example, we discard 1.6 billion pens, 2 billion razors and blades, and 16 billion diapers every year. "Convenience" packaging suited to our high-speed, increasingly busy lifestyles--TV dinners, fast-food containers, microwavable bags of popcorn, and the like--make a substantial contribution to the flood of trash.

"Everybody wants us to pick it up, and nobody wants us to put it down."

*In this report, the term "municipal solid waste" refers primarily to residential solid waste, with some contribution from commercial, institutional and industrial sources. In some areas, nonresidential wastes are managed separately, largely because industrial and some commercial sources produce relatively uniform wastes in large quantities, which makes them more suitable for alternative disposal techniques or recycling. Hazardous wastes, as defined by Federal and State regulation, generally are managed outside the municipal solid waste stream. Exceptions are household hazardous wastes and hazardous wastes generated in very small quantities, which are often placed in the municipal solid waste stream by the generator.

This report does not attempt to grapple with the issue of medical waste. This issue is the subject of a separate EPA Task Force.

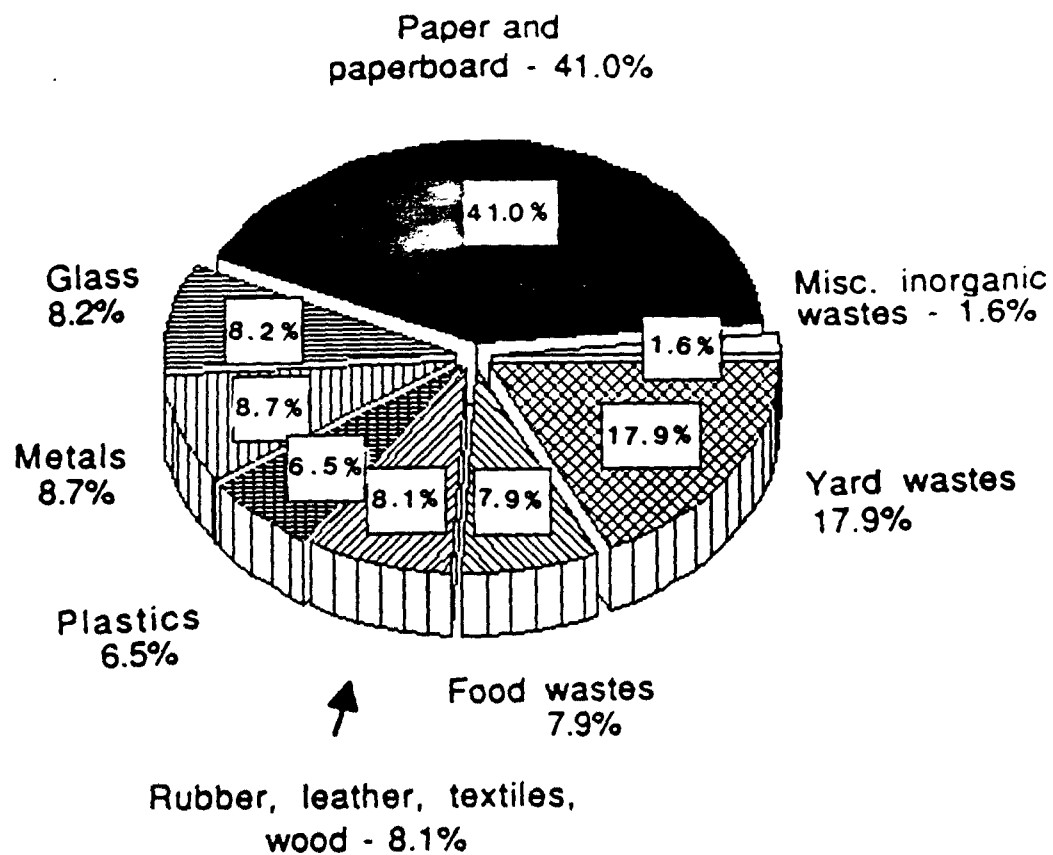


FIGURE 1 - GROSS DISCARDS OF MSW MATERIALS, 1986

(Source : Characterization Of Municipal Solid Waste In The United States, 1960 To 2000; Franklin Assoc, 3/30/88)

People who manage solid waste say that the First Law of Garbage is: "Everybody wants us to pick it up, and nobody wants us to put it down." Many Americans want their trash to disappear quickly and quietly from their backyards and curbs, never to be seen or heard from again. And the last thing they want in their neighborhood is a landfill, incinerator or recycling center--all of which are associated in the public mind with noxious odors, possibly dangerous pollution, and noisy traffic.

These two social forces--the throwaway mentality on the part of manufacturers and many consumers and the NIMBY ("not-in-my-backyard") syndrome--have combined to create a serious and growing solid waste problem in many American cities. As a nation, we are generating more garbage all the time, and we don't know what to do with it. Ineffective or irresponsible disposal of all this waste has the potential to

"The annual U.S. generation of 158 million tons of municipal solid waste would fill a convoy of 10-ton garbage trucks, 145,000 miles long ... over half way from here to the moon."

degrade the environment and cause risk to public health. We're running out of space to bury it in existing landfills; one-third of the nation's landfills will be full within the next five years. Yet because of the NIMBY syndrome and concerns over potential threats to human health and the environment, many cities are unable to find enough acceptable sites for new landfills.

Siting new incinerators can be equally difficult; many people are not convinced that garbage can be burned without producing dangerous air pollution and residues. The problem has gotten to the point that some American cities are paying premium prices to have their trash shipped to other counties, States, and even foreign countries.

In response to this solid waste dilemma, many States, localities, and concerned citizens have stepped up recycling activities and formed comprehensive waste management programs. With their progressive programs, some localities are far ahead of any Federal program for municipal solid waste, while other communities and States lag far behind and may not even recognize or anticipate a problem. The private sector, in the form of the waste management, secondary materials, and manufacturing industries, have also recognized the benefits of recycling and have successfully implemented programs. The Federal role for municipal waste management has ranged through the years from an active nonregulatory role prior to 1980, to a less comprehensive, more regulatory role

since 1980. In the past several years, EPA has proposed revised minimum standards for designing and operating municipal landfills; issued procurement guidelines for some recycled goods; issued a Report to Congress on air emissions from municipal waste combustors; developed a report on the efficacy of the current nonhazardous waste regulations; recently initiated several bulletins and brochures to promote used oil recycling; and conducted a toxicity study on municipal waste combustor ash. EPA also is developing guidance for proper handling and disposal of combustor ash residuals.

More recently, the Environmental Protection Agency created a Municipal Solid Waste Task Force in February 1988 to specifically address the problem of increasing waste generation and decreasing management capacity. The Task Force was given the assignment of quickly assessing the size and scope of the solid waste problem, examining alternatives for solving it, and developing a well-coordinated strategy of action for improving the nation's management of municipal solid waste.

In an effort to make the strategy credible and practical, the Task Force solicited comments from the public and interested groups and organizations. Three public meetings were held: in Boston on May 9, in Seattle on May 11, and in Dallas on May 13. The Task Force also identified interested trade associations, environmental groups, and government organizations and offered drafts of its analysis for their review during the strategy development process. These comments from the public contributed substantially to this Agenda for Action.

This report presents the Task Force's draft national action agenda for public comment.* There is no single solution to this complex problem. A myriad of activities must be implemented, both in the short and long term, by all of us in order to solve the current and future problems with municipal solid waste. This report suggests a number of things that government, business, industry and citizens can do to

*Only the Task Force's recommendations are included in this report; the data and information supporting the recommendations can be found in a supplemental document entitled, "Background Document for The Solid Waste Dilemma: An Agenda for Action, Draft Report of the Municipal Solid Waste Task Force."

reduce the production of solid waste and better manage the solid waste that is produced: manufacturing products with consideration for their ultimate management as wastes; encouraging, producing and buying products that are made from recycled or

"Each of us contributes an average of 1,300 pounds a year to the growing mountain of garbage, and each of us, if we're willing, can cut back on the amount."

recyclable materials; separating bottles, cans and paper and turning them in for recycling; improving the safety and efficiency of landfills and incinerators; and wherever practical, choosing source reduction and recycling over landfilling and incineration as the preferred methods for managing municipal solid waste.

The report reiterates EPA's stated goal* of diverting 25 percent of the nation's municipal solid waste from landfills and incinerators through source reduction and recycling by 1992. Much of this goal will be met through increased recycling, but EPA believes that source reduction to decrease the volume of waste produced is vitally important. Some proposals, such as government incentives to encourage the production of long-lasting products that can be reused or recycled, will be controversial; but the solid waste problem is serious, and controversy is not sufficient reason to ignore workable solutions.

When Congress passed the Resource Conservation and Recovery Act of 1976 (RCRA), it recognized that State and local governments have primary responsibility for municipal solid waste management, but it also gave EPA regulatory and assistance responsibilities in this area. Many of the recommendations in this report were developed with the recognition that strong national leadership is essential in finding solutions to what has become a widespread national problem. National leadership means not only establishing national goals and policies, but setting a good example by purchasing recycled or recyclable products and by separating waste to facilitate recycling or safe disposal.

Each of us contributes an average of 1,300 pounds a year to the growing mountain of garbage, and each of us, if we're willing, can cut back on the amount of waste

*This goal was first stated by the Assistant Administrator of the Office of Solid Waste and Emergency Response, J. Winston Porter, in a speech at the Fourth Annual Conference on Solid Waste Management and Materials Policy, on January 29, 1988

requiring disposal. Industry can also work toward reducing the volume and toxicity of products and packaging that will ultimately require disposal. The report recommends a number of educational and other programs to inform citizens and industry about their responsibilities and opportunities to help stem the tide of solid waste.

It is important for all of us--government, business, and private citizens--to acknowledge that our country has a solid waste problem and to begin the difficult but inescapable task of finding solutions. If we wait, the problem will only get worse. If this draft report stimulates thought, discussion and action to help improve the management of our nation's municipal solid waste, it will have accomplished its purpose.

SCOPE OF THE PROBLEM

When local officials are asked to list the chief problems associated with municipal solid waste, they usually cite the growing shortage of landfill capacity and the high cost of managing waste. These two management problems are especially severe

"In 1960, Americans generated waste at a rate of 2.65 pounds per person per day; by 1986, that figure had jumped to 3.58 pounds."

in some American cities, where disposal costs have soared to more than \$100 per ton of waste because of long-distance hauling and high landfill and incinerator "tip" fees.¹ Last year's international wanderings of the barge Mobro 2000, forlornly searching for a last resting place for garbage from Islip, New York, graphically

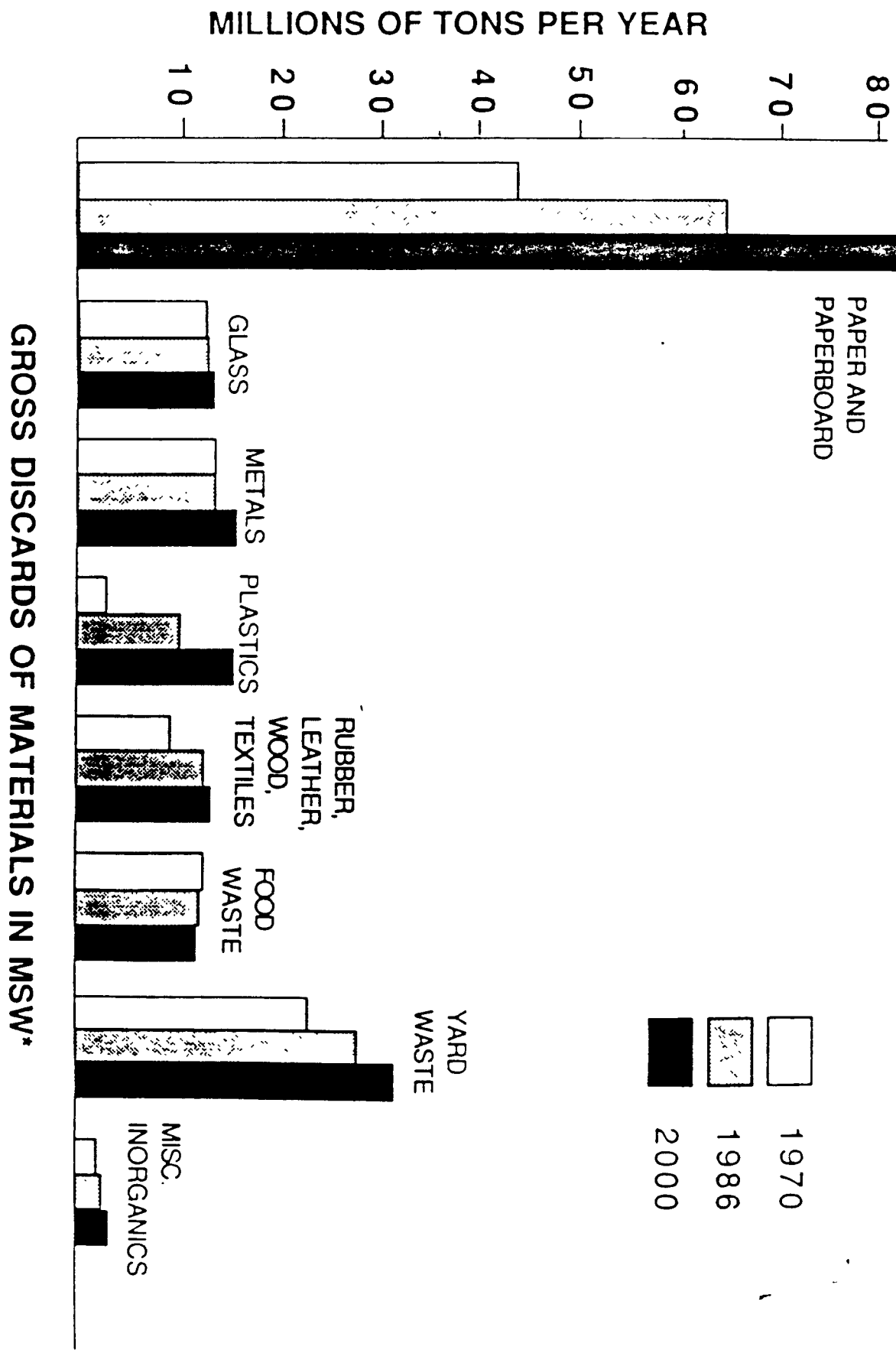
illustrated the capacity shortages in populous communities. Some States and localities have responded to this problem by enacting laws requiring mandatory recycling or discouraging waste generation.

High costs and capacity shortages, however, are only symptoms of a more basic problem: Most of America's citizens, officials and industry have yet to recognize their responsibility for the growth in solid waste and for the problems caused by that growth. In 1960, Americans generated waste at a rate of 2.65 pounds per person per day; by 1986, that figure had jumped to 3.58 pounds, and the trend is expected to continue into the Year 2000.² Generation of every kind of waste is up, including paper, plastic, glass, and metals, as shown in Figure 2. An American generates approximately one pound per day more waste than his/her counterpart in West Germany, an equally industrialized nation.³ Much of the difference can be traced to the high

¹ Frank J. Sudol and Alvin L. Zach, "Recycling in New Jersey: the Newark Experience," Resource Recycling, Volume VII, No. 2, May/June, 1988, p. 28.

² Characterization of Municipal Solid Waste in the U.S. 1960-2000 (updated 1988), Franklin Associates, March 30, 1988.

³ Allen Hershkowitz, Ph.D., "Garbage Burning--Lessons from Europe: Consensus and Controversy in Four European States," Inform, 1986, p. 13.



*Ref: Characterization Of Municipal Solid Waste In The United States 1960 To 2000. Franklin Assoc. 3/30/88

FIGURE 2

level of product manufacture and consumption in this country and the need for convenience on the part of increasingly busy families. In general, American consumers have no incentive to limit their waste generation, because they are not charged for disposal according to the amount of waste they produce. Nor are there many incentives for manufacturers to design their products and packaging in a way that takes into account the effective management of those products when they are eventually discarded.

At the same time more waste is being generated, less processing and disposal capacity is available to handle it. One-third of the nation's landfills will be full by 1993, which means that waste that is now disposed of in these facilities will have to be disposed of elsewhere. Many existing facilities are closing either because they are filled or because their design and operation do not meet Federal or State standards for protection of human health and the environment. New facilities must be built to replace this diminishing capacity but must be environmentally sound, preserve valuable resources, and not present undue risk to human health. The incentive to build new, environmentally sound facilities and adopt better management practices may not exist in some areas because of the current practice of "waste flight," in which waste is shipped by truck or rail across State and county lines to areas with available capacity. If not done concurrently with long-term planning to solve the capacity problem for a region, the short-term solution of waste flight only delays the inevitable management problem in the locality shipping the waste, and hastens potential problems in the area that receives and disposes of the waste.

Efforts to site new landfills, incinerators and recycling centers, however, are met with mounting opposition. This opposition may stem from concerns about environmental or health risks from contaminated ground and surface waters and soil, toxic ash from municipal waste combustion, and air emissions; from resistance to such nuisance factors as noise, smells, and truck traffic; and from anxiety over property values. Because few governments have established effective dispute resolution mechanisms, "siting impasses" result when local politicians are unwilling or unable to override the objections of their constituents. These siting disputes illustrate

the fact that few of us are eager to assume responsibility for either our neighbors' wastes or our own.

Although recycling and reuse of waste materials are publicly acceptable methods for managing municipal solid waste, the existing waste management infrastructure often discourages effective recycling efforts. For example, a national policy supporting the use of a waste management "hierarchy" has been in effect since 1976.⁴ Under the hierarchy, source reduction and recycling are the preferred options for managing solid waste. Incineration and landfilling are to be used only when the preferred options are unavailable or insufficient. Overwhelmed by the burgeoning amounts of waste that must be removed from the curb every day, most waste managers are unable to plan or implement the hierarchy at the local level. As a result, 80 percent of the nation's waste is landfilled; only 10 percent is recycled and 10 percent incinerated. This reliance on landfilling may stem from a desire for a single, "quick-fix" solution; more recently, many public officials seem to be turning to mass-burn incinerators as the "silver-bullet" answer to their waste management problems. The temptation to build a facility that can incinerate 2,000 tons of garbage a day may be difficult for a hard-pressed waste manager to resist.

Why aren't many States and localities implementing the waste management hierarchy? One reason is that local officials may consider recycling programs too costly. This happens when officials do not compare recycling costs with the true cost of handling the same waste in a landfill and incinerator, including the expense of monitoring, closure, and possible remediation of environmental hazards. (In addition, the true costs of landfilling and incineration may not be known.) Public works officials also may not consider recycling a reliable way to handle municipal solid waste because success in recycling depends heavily on markets for secondary materials as well as public participation levels, both of which can fluctuate widely.

⁴ Effective Hazardous Waste Management (Non-Radioactive); Position Statement, Federal Register, Volume 41, No. 161, August 18, 1976.

This brief description of the scope of the problem is by no means comprehensive. It is meant to establish the basis for setting goals and actions for a national strategy. Chapters 2 and 3 of the Background Document provide a more thorough description of the problems involved in managing municipal waste.

INTEGRATED WASTE MANAGEMENT

The term "integrated waste management" refers to the complementary use of a variety of waste management practices to safely and effectively handle the municipal solid waste stream with the least adverse impact on human health and the environment. An integrated waste management system will contain some or all of the following components:

- o Source reduction (including reuse of products)
- o Recycling of materials (including composting)
- o Incineration (with or without energy recovery)
- o Landfilling.

In integrated waste management, all the elements work together to form a complete system for proper management of municipal waste. Waste stream constituents are matched to the management practices that are best suited to those particular constituents. In order to reduce toxics, reduce quantity, and safely extract any useful energy or material from the waste prior to final disposal.

Every community can "custom-design" its integrated waste management system to emphasize certain management practices, consistent with the community's demography and waste stream characteristics. For example, a community like Las Vegas, Nevada, where landfill tipping fees as low as \$6 per ton reflect the ready availability of land⁵, may choose to continue to rely on landfilling as its primary waste management practice after evaluating the feasibility of source reduction and recycling. Conversely, a

⁵ C. L. Pettit, "The 1987 Tip Fee Survey - Last Year's Rise was the Biggest Ever," Waste Age, Vol 19, No 3, March 1988, p. 77

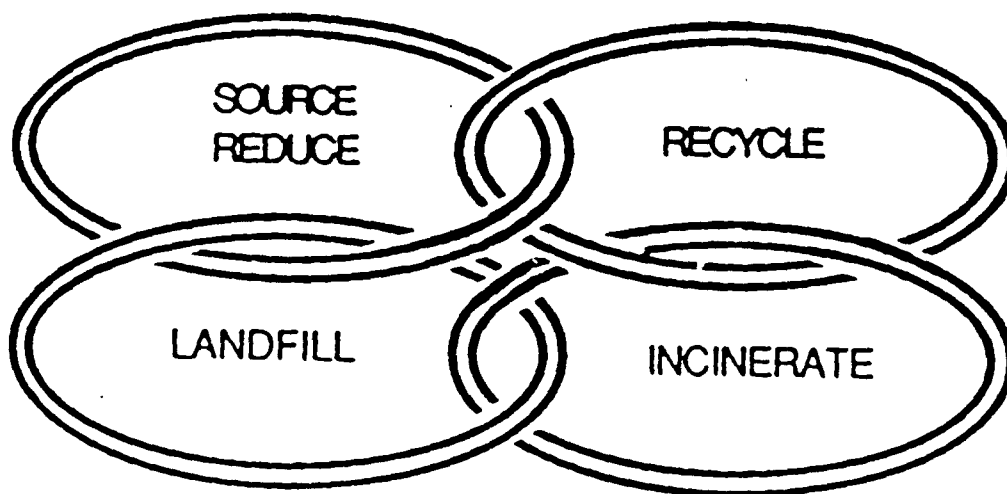
town such as East Lyme, Connecticut, where disposal costs exceed \$100 per ton, finds recycling an essential way to handle a major part of the waste stream.⁶

Every community can "custom-design" its integrated waste management system to suit its needs.

In an integrated waste management system, each component is designed so it complements, rather than competes with, the other components in the system. For example, the negative impact of diverting some combustibles from an incinerator for recycling is avoided if the incinerator is designed to handle a volume of waste with a certain Btu value after allowing for the effect of recycling on total waste volume and Btu values.

Hierarchy of Integrated Waste Management

To most effectively reduce our waste management problems at the national level, States, municipalities, and the waste management industry should use the hierarchy described below for evaluating the components of integrated waste management against the community's needs. Of course, strict adherence to a rigid hierarchy is inappropriate for every community. Manhattan, Nevada will very likely choose a different mix



⁶ "Transcript of the Public Meeting on Municipal Solid Waste," Boston, Massachusetts, May 9, 1988, RCRA Docket #F-88-MTFN-FFFFF, EPA, Office of Solid Waste, 401 M Street S W , Washington D C 20460

of options than Manhattan, New York. But the integrated waste management hierarchy is a useful conceptual tool for both communities to use in setting goals and planning for their particular mix of waste management alternatives.

The hierarchy begins with source reduction and reuse to reduce both the toxic constituents in products and the generation of large quantities of waste. Source reduction, as defined in this report, may occur through the design and manufacture of products and packaging with minimum toxic content, minimum volume of material, and/or a longer useful life. Source reduction may also be practiced at the corporate or household level through selective buying habits and reuse of products and materials. Effective source reduction slows the depletion of environmental resources, prolongs the life of available waste management capacity and can make incineration and land-filling of wastes safer in the short and long term by removing toxic constituents. Source reduction is not used by local waste handlers for managing the waste that is picked up every day; rather, it is a technique for preventing waste from having to be managed at all. However, local government can encourage as well as practice source reduction.

The second rung in the hierarchy is recycling of materials, including composting of food and yard waste. Recycling is near the top of the hierarchy because it prevents potentially useful materials from being burned or buried, thereby preserving waste disposal capacity. Recycling is a technology that can prevent depletion of valuable landfill space, save energy and natural resources, provide useful products from discarded material, and even make a profit (especially when the avoided costs of incineration or landfilling are taken into account). Thus, public officials and waste handlers should give serious consideration to the practicality of recycling programs in their communities.

Although lower than source reduction and recycling in the hierarchy of desirable waste management options, incineration is useful in reducing the bulk (although not all) of municipal waste and can provide the added benefit of energy production. Although incineration is not risk-free, a state-of-the-art incinerator that is well

operated should not present a significant risk to human health and the environment. When recycling is part of a community's or a waste handler's chosen integrated waste management system, incineration can complement recycling by reducing the bulk of the nonrecyclable, nonreusable waste. Using source reduction, reuse and recycling to manage wastes that do not lend themselves to incineration can mitigate problems associated with incineration, such as potentially harmful stack emissions or operational problems caused by heterogeneous waste mixtures. Residual ash is another problem associated with incinerators because of the sometimes high metals content and the need to manage it properly.

Landfilling also is lower in the hierarchy than source reduction, reuse and recycling, but is essential to handle wastes such as nonrecyclable waste and the noncombustibles such as demolition waste and construction debris. In addition, landfills can provide the benefit of energy production through recovery of methane gas. Landfills designated for handling incinerator ash residuals are essential and, in the absence of alternative ash management plans, must be planned and designed in conjunction with the incinerator. Landfills should also be used for materials that cannot practicably be managed in any other way. A well-constructed, properly operated landfill should not present a significant health risk. As previously mentioned, some communities and waste handlers, based on land availability and population characteristics that make recycling impractical, may choose landfilling as their principal method of managing municipal waste. For the foreseeable future, landfills will be necessary to handle some wastes, so steps must be taken to make landfilling as safe as possible.

Who's Responsible?

We all are. Everyone has a role in making integrated waste management work. Industry has a responsibility to consider source reduction, reuse and recyclability in designing products and packaging, and to use secondary materials in their manufacture. Citizens have a responsibility to learn about the products and packaging they buy and the waste they create. What is in the product? What is recyclable? What is

potentially harmful? How long will the product last? How much does it cost to dispose of it? Every individual and corporate citizen should assume responsibility for waste disposal and adopt a "pay-as-you-throw" attitude--a recognition of the true costs of disposing of the wastes we generate.

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WE ALL ARE.

Everyone has a role in making integrated waste management work.

Waste management companies, including processors and handlers of secondary materials, have a responsibility for planning and implementing integrated waste management for their communities. They should work in partnership with State and local public officials to plan and implement integrated waste management and to educate the public. This partnership can be an effective mechanism for managing municipal solid waste.

All levels of government, especially State, Tribal and local, are ultimately responsible for managing waste and planning the mix of management options that will most effectively handle the waste stream. The Federal government should participate in municipal solid waste management by establishing national goals and leadership, developing education programs, providing technical assistance, and issuing regulations. The Federal government also has a role in establishing a framework for State, Tribal and local planning, setting minimum standards for facilities, and encouraging the manufacturing industry to design products and packaging for effective waste management, as well as to utilize secondary materials in manufacturing. Finally, all levels of government should set a good example by purchasing recycled or recyclable products and products that have been subject to source reduction whenever possible, and handling their own wastes in a way that facilitates recycling and reuse.

Planning

Planning is a vital component in achieving a national goal of integrated waste management. Siting, designing, and building a landfill or combustion facility can take many years. Similarly, collection and recycling programs may take several years to develop to full scale. This delay is especially difficult for communities

experiencing an immediate waste handling capacity shortage, but it also may affect communities that face possible capacity problems in the future. Thus, States, Indian Tribes and local communities should actively plan short- and long-term waste programs based on current and projected characteristics of their waste streams.

Evaluating and implementing, where feasible, the integrated waste management hierarchy at the local level helps solve the problems associated with waste management. Minimizing toxicity and volume through source reduction, reuse and recycling directly addresses the problem of capacity shortage and potential risks from toxic constituents.

NATIONAL GOALS

The problems associated with municipal solid waste management, including cost and capacity, are felt most directly and can best be handled at the local level through implementation of integrated waste management practices. These problems, however, are also regional and national in scope. The widening gap between available capacity and levels of waste generation demands national solutions and a long-term commitment by all. We can no longer rely on landfills to handle 80 percent of the nation's waste. The United States must find a safe and permanent way to eliminate the gap between waste generation and available capacity in landfills, incinerators, and in secondary materials markets.

How can this goal be accomplished? We must take short-term actions now in order to solve the problems of today and tomorrow. Above all, we must increase source

The United States must find a safe and permanent way to eliminate the gap between waste generation and available capacity in landfills, incinerators, and in secondary materials markets.

reduction and recycling activities while making all management options reliable and safe. EPA believes that, to the extent practical, source reduction and then recycling are the preferred options for closing the gap and reducing the amount and toxicity of waste that must be landfilled or incinerated. To foster implementation of this preference for source reduction and recycling,

EPA set a national goal in January 1988 of 25 percent source reduction and recycling (up from the current 10 percent) by 1992. Although recycling will play the major role in this goal, source reduction is an important component. In addition, EPA's long-term goal for source reduction is to slow substantially the projected rate of increased waste generation by the Year 2000. Source reduction and recycling help prevent many of the problems associated with municipal solid waste, including the pressing need to site new landfills and incinerators to handle the large volumes of waste being generated. Preventing generation of wastes

and diverting waste components from landfills and incinerators into reuse, recycling or composting helps to alleviate siting problems and potential risks to human health and the environment attributable to improper management. Thus, planning and implementing these activities now yields benefits in managing wastes in the years to come.

Even the most effective source reduction and recycling efforts, however, cannot handle the total waste stream. Thus, EPA believes that all waste management practices should be made safer. We will need landfills and incinerators into the foreseeable future to process and dispose of some portion of the waste stream. Improving the safety of these disposal alternatives, as well as materials recovery and recycling facilities, can help protect human health and the environment and can only help gain public acceptance of all such facilities.

Objectives

The Task Force has identified six objectives for a national agenda for action to solve the municipal solid waste dilemma. By fulfilling these objectives, we help overcome many of the problems associated with municipal solid waste management, including siting problems, increased waste generation rates, concerns over human health and the environment, and, perhaps, some of the high costs of waste management. In addition, by carrying out these objectives--especially by increasing source reduction, recycling, and effective planning--government, industries, waste managers and citizens will have helped fulfill the concept of integrated waste management and will learn to look beyond the "single solution" to waste problems. The objectives are:

- 1. Increase the waste planning and management information (both technical and educational) available to States, local communities, waste handlers, citizens, and industry, and increase data collection for research and development.**
- 2. Increase effective planning by waste handlers, local communities, and States.**

3. **Increase source reduction activities by the manufacturing industry, government and citizens.**
4. **Increase recycling by government and by individual and corporate citizens.**
5. **Improve the safety of municipal solid waste combustion in order to protect human health and the environment.**
6. **Increase the safety of landfills in order to protect human health and the environment.**

The following Agenda for Action is structured within the framework of these six objectives. Each objective is briefly described, and roles for government (Federal, State, Tribe and local), industry and citizens are summarized. A table of next steps follows each objective, for easy reference by the reader.

The Task Force received many suggestions on potential actions, and studied a number of different options. The following action items are culled from the larger array of options, and constitute a minimum program for meeting the above-stated goals. Many of these actions received broad-based support from peer reviewers and/or were suggested by many different interested and concerned parties during the public comment period. Elements that were noted by commenters as being especially important are a national clearinghouse for information dissemination, Federal procurement guidelines for recycled goods, market development studies for recycling, design and operation standards for landfills, and air emission and operator certification standards for incinerators.

AN AGENDA FOR ACTION

To most effectively reach the goal outlined above, the Task Force's recommended actions focus on reducing large-volume contributors to the waste stream. For example, paper and yard wastes are targeted for special action because they contribute nearly 60 percent of the waste stream. While EPA has targeted paper and yard wastes for special consideration, the Agency realizes the importance of addressing other wastes to reduce toxicity, and to pursue opportunities for recycling. In addition, "orphan" wastes such as tires and batteries are highlighted because they are not now managed in any cohesive way, and can present environmental and health problems and management headaches.

I. OBJECTIVE: INCREASE AVAILABLE INFORMATION

Technical assistance, education, and research and development are important ways to encourage informed participation in achieving waste management goals. These goals may be the national goals, as described above, or they may be the basis for State, Tribal or local integrated waste management programs. Educational materials increase awareness of good waste management "ethics" while technical assistance ensures that all types of waste handlers (Individuals, government, industry) have all the information that they need to manage safely and effectively. Data collection and research and development expand the boundaries of our knowledge, giving us new information, new technologies and new solutions.

Through participation in every level of effective waste management, citizens and the manufacturing industry must take responsibility for the waste they generate. The way to enhance participation is through development and efficient delivery of educational and technical guidance for all audiences. This section describes development of technical and educational guidance, data collection and research and development programs, and delivery systems such as a national clearinghouse and a "peer

matching” program that matches experts in waste management to communities in need of help.

Develop Materials on General Topics and Specific Technical Areas

-Technical Guidance Documents-

Guidance and materials on the technical aspects of source reduction, combustion, recycling, landfilling, composting, and collection are important for increasing the quality of waste management by everyone. These materials provide the “how-to” for the consumer, the government, and the waste handler to effectively reduce waste generation, and prevent management and environmental problems.

Educational materials provide a way to change “business as usual” in our society by giving people the necessary background information to determine “good” and “bad” waste management.

The technical materials should address at least these areas:

- o What factors decision makers should consider in choosing among waste management options.
- o How each community can compare the risks of each management alternative.
- o How to determine the true costs of waste management, and how to calculate the management costs avoided through choosing one waste management alternative over another.
- o How citizens and businesses can implement source reduction through their consumption habits (e.g., ways to reduce paper consumption through double-side copying).
- o How to set up a community recycling program.
- o How homeowners can effectively backyard compost their yard wastes, and can use backyard or commercial compost in landscaping, building, or gardening.
- o How to create incentives for and overcome barriers to successful source reduction and recycling programs.

- o What to look for in designing and operating combustion facilities, including waste-to-energy methods, and landfills.
- o How to market secondary materials and energy generated by waste-to-energy plants and methane from landfills.
- o How to market compost, and ensure quality compost products.
- o What terms like "recycled" and "recyclable" mean (what the minimum amount of secondary materials is for a product to be called "recycled").
- o How to insure that goods labeled as "recycled" or "recyclable" are genuine.
- o How to collect and process tires, including a processing method for making refuse-derived fuel from tires and guidance on marketing this fuel; management of tires in landfills, management of tire piles; and recycling of tires.
- o How to handle lead-acid batteries, including guidance on proper design and operation of collection and processing facilities and metal-recovery operations.
- o How to manage and reduce household hazardous waste, including paints, cleaners, solvents, used oil, etc.
- o How biomedical wastes should be handled and treated.
- o Whether labeling such as "recycled," "recyclable," and "designed for safe disposal in an incinerator or landfill" is effective and feasible. (Such labeling is believed by many to be useful in raising public consciousness. But, concerns over issues such as the need for Federal oversight, defining these terms, and "truth in advertising" problems must be studied.)

Work on some of these materials is already underway by EPA, State and local governments, the waste handling industry, trade associations and public interest groups. This list of materials is a sample of what could and should be done, but it is by no means exhaustive. EPA will evaluate what is available and what is needed for technical materials.

-Educational Materials-

Educational materials provide a way to change “business as usual” in our society by giving people the necessary background information to determine “good” and “bad” waste management. The target audience for these materials is varied, including waste generators (households, businesses, and industry), waste planners, and waste managers. It is as imperative to inculcate the ethics of integrated waste management into the public works official as it is the homeowner.

Many excellent educational materials have already been developed by some States, localities, public interest groups, and trade associations. A comprehensive educational program should, at a minimum, address the following areas and audiences:

- Pamphlets and brochures for the general public, describing the components and concepts of integrated waste management, the risks and costs associated with various management options, and questions that citizens should ask about the wastes they generate and waste management in their communities. Brochures should also emphasize questions citizens should ask themselves about the waste they generate and should encourage citizens to conduct waste audits on their household wastes.
- Curricula for school children and teenagers that not only explain different waste management methods and issues, but also incorporate municipal waste issues into a variety of subject areas (e.g., arithmetic problems) in order to raise general consciousness. Such educational materials could also include coloring books, videos, and field trips.
- Materials and forums to inform the design and manufacturing industries of the importance of source reduction and the design of products and packaging with an eye toward the eventual safe disposal or recycling of the waste.
- Materials to encourage participation in recycling. Collection and separation methods for paper and plastics, by both households and businesses, would be stressed. Other materials could include pamphlets explaining the cost savings associated with recycling process and scrap wastes in industry. Materials could also include bumper stickers, posters, and billboards.
- Informational pamphlets explaining the true costs of waste management. These would be used by waste handlers, local governments and citizens for making more informed decisions.

EPA will collect existing materials and foster development materials necessary to fill the gaps in general educational materials.

Data Collection and Research and Development

Adequate and accurate data are vital underpinnings to any municipal solid waste program. We cannot evaluate the progress in meeting national or local goals without data. Adequate data allows us to make informed decisions and prevent undue risks from waste management. Important data gaps that must be filled in include characterization of the waste stream and waste management practices. A comprehensive research and development program is necessary to continue upgrading the quality of waste management practices. Industry and all levels of government must forge a partnership for conducting research and development in all areas of municipal waste management. Industry especially can assume a leadership role in the areas of source reduction and recycling technologies by finding substitutes for toxic materials in products, reducing the volume of material in products, and increasing recycling practices and technologies.

-Characterize the Waste Stream and Waste Management Practices-

The Federal and State governments should gather summary data generated by the public and private sectors on waste characteristics and management practices. This data should be used to trace national trends and facilitate short- and long-term planning. All levels of government should institute databases for tracking volumes and types of wastes in order to facilitate planning at the State and local level. This characterization should study individual constituents in the municipal solid waste stream to determine progress in source reduction and recycling and targets for significant volume and risk reduction.

-Research and Development-

Research and development is needed in technical areas related to combustion (ash and air emissions), landfilling, recycling technologies, designing for effective waste

management (e.g., reducing toxics, increasing recyclability and durability), source reduction, and risk assessment.

EPA has planned for and is currently conducting some research and development, primarily in the areas of incineration and landfilling to support the development of regulations and guidance. EPA is developing a separate agenda for research and development necessary to augment what is currently underway, and will solicit comments and ideas from outside parties in a conference in January 1989.

EPA should coordinate its initiative closely with those of private industry. In cooperation with industry, EPA will generate a joint industry-EPA research agenda providing for coordinated studies in various areas such as the assessment of emerging commercial technologies, impacts of household hazardous waste and very small quantity generator wastes on landfill leachate and combustor residuals, and identification of substitute materials for toxics in products.

Establish Systems to Disseminate Information and Assistance

Some States, trade associations, and public interest groups have taken the initiative to form State or regional "libraries" or telephone "hotlines" on a variety of waste management subjects.

Although many excellent educational and technical materials, expertise, and data exist, systems for sharing these materials, data and expertise are sadly lacking. Some States, trade associations, and public interest groups have taken the initiative to form State or regional "libraries" or telephone "hotlines" on a variety of waste management subjects. However, a systematic, nationwide information-sharing mechanism for all waste management subjects and audiences does not currently exist. This lack of a nationwide system results in relatively few people accessing the technical and informational materials that they need. Another result is duplication of effort by organizations developing materials that, unknown to them, already exist.

-National Clearinghouse-

A national clearinghouse will provide the mechanism for citizens, government and other organizations to request and receive materials on any subject related to municipal waste. The clearinghouse could act only as a distribution center for materials, or it could develop these materials, if adequately staffed and funded. Materials for distribution by the clearinghouse would include those educational and technical guidances and results of research and development mentioned earlier under this Objective, bibliographies of available literature in different subject areas, and materials developed by the Federal government, States, municipalities, public interest groups, trade associations, and industry.

EPA, in partnership with another entity such as a university, public interest group, or trade association, will partially fund the clearinghouse, at the outset, but the clearinghouse should become nearly self-sustaining, and thus more likely to continue. EPA could fund the clearinghouse through a variety of mechanisms including seed money to a university, a public interest group, governmental associations or other nonprofit organizations. EPA's Office of Research and Development, or the Agency's RCRA Hotline could also be instrumental in running a clearinghouse. EPA is looking at funding from existing resources.

-“Peer Matching” Program-

As part of the clearinghouse concept, a “peer matching” program would match the expertise available in local communities, trade groups, States, Indian Tribes, EPA regional offices, or universities to waste managers in other communities in need of assistance. Such a program would effectively use existing resources to better manage municipal solid waste. For example, a community wishing to design and implement a curbside collection program for recyclable materials could use the peer matching program to tap into the expertise of a community with a similar program. The program would function as a “database” of people and experience to match the needs of communities seeking assistance.

Other Information-sharing Mechanisms

In addition to the large-scale programs outlined above, many mechanisms for delivering information on waste management may be useful at the national, regional, State, Tribal and local level. These smaller systems focus on particular audiences, a certain subject area, or a certain message, and include the following:

- o Accessing existing organizations and their networks of constituents, such as Keep America Beautiful, the Governmental Refuse Collection and Disposal Association, National Association of Counties, National League of Cities, and many more
- o Magazine and newspaper articles, radio and television shows and advertisements to raise awareness of waste management and responsibilities
- o Itemized tax bills, quarterly reports, or "garbage bills" to educate the waste generator on costs of waste management
- o Public meetings and hearings on waste management issues
- o Labeling of products by industry as to proper disposal methods.

Summary of Participants in Increasing Available Information

Technical and educational materials and data collection methods should be developed by EPA, States, Tribes, municipalities, public interest organizations, all industry (waste management, design and manufacturing, secondary materials) and trade associations. All parties have expertise in a range of waste management areas and should contribute to developing needed materials. EPA will tap into existing materials, where possible and develop materials through in-house expertise and/or grants to other organizations and universities. For example, in developing a model methodology to calculate both the true costs of waste management methods and the costs avoided by choosing one method over another, EPA can take advantage of methodologies already developed by various groups, and compile them into a general model with an accompanying sensitivity analysis to indicate the most

Some local governments have imposed waste management "user charges," levied on households and businesses based on the amount of garbage generated.... "pay as you throw"

Important components of the cost equations. EPA will formulate a research and development agenda, using input from outside parties.

For information-sharing mechanisms, as mentioned previously, EPA will plan and provide seed money for the national clearinghouse and peer matching program in order to assure national distribution and accessibility. State, Tribal and local governments, being closer to the generator of waste, are often in the best position to target messages and audiences for educational materials. Incorporating public education programs into the State, Tribal and local planning process, especially materials and forums related to siting any new municipal solid waste management facility, allows for consistent and comprehensive programs. State, Tribal and local governments should also incorporate materials related to solid waste issues and management into the public and private school curricula, and pass on to the waste generators the cost of waste management in the community. Some local governments have imposed waste management "user charges" on households and businesses based on the amount of garbage generated. These "pay as you throw" policies can show the citizens, in very concrete terms, the cost of their garbage production. EPA needs to do more research on the effect of user charges on illegal dumping and littering. Finally, if people in the community are concerned about emissions or nuisance factors from nearby facilities, local officials should keep them apprised of monitoring results or other actions through regular bulletins, the newspaper, or other media.

TABLE 1.
NEXT STEPS FOR EPA TO INCREASE INFORMATION

Develop Educational Materials

Survey of available materials	NOVEMBER	1988
Catalog/bibliography of available materials Design/approve program to fill gaps	MARCH	1989
Evaluate available methodologies and gaps for true cost accounting and cost avoidance	JANUARY	1989
Issue model cost methodology	AUGUST	1989

Develop Technical Materials

Develop model management plan for tires	JANUARY	1990
Other technical assistance: evaluate what is available and what is needed	MAY	1989
Develop guidance on collecting, handling and recycling lead-acid batteries	JANUARY	1989
Publish decision-makers guide for local waste managers	JUNE	1989

Collect Data and Establish Research and Development Agenda

Waste stream characteristics and waste management database established	JANUARY	1990
Research conference to coordinate EPA research and development with other efforts	FEBRUARY	1989

Establish a Clearinghouse

Evaluate needs for a clearinghouse and possible roles	OCTOBER	1988
Clearinghouse operational	DECEMBER	1989

TABLE 1. (Continued)

NEXT STEPS FOR EPA TO INCREASE INFORMATION

Establish a Peer Matching Program

Review present and previous peer matching programs	SEPTEMBER 1988
Program operational	JULY 1989

II. OBJECTIVE: INCREASE PLANNING

Planning by any level of government and the waste management industry is vital for managing all municipal solid waste in a safe and effective way. Planning ensures that future capacity needs are taken into account when establishing programs. Planning also ensures that orphan wastes such as tires and lead-acid batteries are handled comprehensively, rather than with the current piecemeal approach.

Develop State and Local Strategies for Integrated Waste Management

-State Strategies-

State strategies for managing municipal solid waste are important in addressing the current problems faced by communities within the State, and in forecasting and preventing future problems. State strategies force governments to look beyond the single solution to today's problem to a comprehensive waste management plan that will head off or respond to future problems. Indian Tribes, which manage their municipal solid waste independently from the States, must also generate comprehensive strategies for managing solid waste.

State strategies force governments to look beyond the singular solution of today's problem to a comprehensive waste management plan ...

States and Tribes should plan for overall integrated solid waste management. This planning could be done by collecting and evaluating local plans, setting statewide goals for waste handling, and developing policies or legislative initiatives that help the State attain these goals. Indian Tribes could generate plans for individual reservations by seeking assistance from Tribal associations, States, or the Federal government. In planning, States and Tribes should work with waste management and secondary materials industries to access existing networks for collection and marketing of waste and recyclable materials.

State and Tribal integrated waste management strategies should contain at least the following components.

- o Goals for source reduction and recycling of materials
- o Materials and markets that will be targets for source reduction and recycling
- o Market development plans for secondary materials, including intermediate markets (brokers, scrap dealers and processors), final markets (manufacturers), and use of existing networks of secondary materials dealers
- o Composting plans, including collection, processing (backyard, commercial) and marketing methods of yard waste.
- o Short and long-term capacity assurance
- o Calculations for properly sizing combustion facilities, after accounting for waste diverted through recycling
- o Land-use planning for siting new facilities
- o Dispute resolution methods to prevent stalemates in siting any type of waste management facility
- o Plans for collecting and managing "orphan" wastes such as tires and lead-acid batteries
- o Education and technical assistance programs, including education on true-cost accounting and cost avoidance, and risk assessment methodologies
- o Methods for communicating to the public the results and methods of assessing risks of waste management alternatives
- o Methods for ensuring public participation in decision making and planning
- o Enforcement programs for design and operation of waste handling facilities
- o Examination of State government procurement policies to promote recycling and source reduction, and separation of recyclable goods
- o Investigation of regional solutions on a multistate basis, as well as an intrastate basis
- o Plan for segregating, treating, transporting and disposing of medical waste

State planning conferences and regional workshops to provide a forum for States to share their expertise, programs, and problems would encourage States to plan. Some conferences will be sponsored by EPA. In addition, EPA regional offices would review strategies voluntarily submitted by States and Tribes and offer technical assistance upon request. Review of State strategies would help EPA develop technical guidances and areas for peer matching.

-Local Planning-

Planning should be done at the local level as well, by:

- o Characterizing the waste stream
- o Setting municipal goals for recycling and source reduction
- o Evaluating local markets
- o Identifying incentives and disincentives for local integrated waste management
- o Planning for "orphan" wastes
- o Implementing true-cost accounting.

Plans should indicate the roles of the public and the private sector in implementing waste handling and other programs.

TABLE 2.

NEXT STEPS FOR EPA TO ENCOURAGE INCREASED PLANNING

Develop State Strategies

Design a national conference or series of regional workshops for States and Tribal association	SEPTEMBER 1988
Target date for conference	JULY 1989
Target date for regional workshops	NOVEMBER 1989
States submit draft State strategies to EPA to help in designing EPA's Technical Assistance Program	JANUARY 1990

III. OBJECTIVE: INCREASE SOURCE REDUCTION ACTIVITIES

Source reduction, that is, minimizing toxics and volume in products and extending their useful life, is a key component for meeting national and local goals. Removal of toxics enhances the safety of recycling, landfilling, and incineration. Lead and cadmium are examples of known toxicants, present in variable quantities in many common products. Both lead and cadmium have been found in high concentrations in municipal waste combustor ash and leachate from municipal solid waste landfills. Volume reduction helps to eke out remaining capacity, thereby easing the "crisis" situation

By slowing the rate at which products are discarded, waste handling and disposal capacity can be extended.

and allowing time for long-term planning. Although there are many players in source reduction, the design and manufacturing industry can provide a leadership role in instigating change and increasing source reduction activities. In addition, the Federal government can provide consistency through regulation or other national initiatives. Important source reduction activities include minimizing toxics, minimizing volume, increasing procurement of source-reduced goods and investigating ongoing source reduction activities.

Minimize Toxic Constituents and Materials in Municipal Solid Waste

Minimizing the amount of toxic constituents that enter the municipal solid waste stream is important in making every waste handling and management alternative safer. As discussed previously, minimizing toxic materials, such as lead and cadmium, can reduce metals in incinerator ash residues, decrease the pollution potential of landfill leachate and incinerator stack emissions, and increase the safety of recycling waste materials. Risk assessments are necessary, however, to determine if reducing risks at the disposal point in a product's lifecycle causes increased risks from the product at other points in its lifecycle, for example, during manufacture.

Products should not contain lead and cadmium when less toxic materials can be feasibly substituted. Lead and cadmium, although not the only toxic elements or compounds found in municipal waste, are good first candidates for examining the feasibility of substitution because high concentrations of both metals are found in incinerator ash. Considerations for substitution include: the extent to which the metal is at a level or in a form that could lead to significant release upon disposal, technical feasibility, impact on product performance or cost, and financial burden to industry and the consumer. Industry should evaluate whether lead and cadmium can be feasibly replaced, while EPA will study the sources of lead and cadmium and determine regulatory and nonregulatory options.

Constituents other than lead and cadmium should be studied for their potential to release when disposed. These constituents could include those that have been found in municipal solid waste landfill leachate or air emissions, or incinerator stack emissions and may include other metals and inorganic compounds, and organics.

Where substitution of less toxic materials would be burdensome, products should be tested for their release and/or exposure when disposed of or recycled. Labeling those products that have been tested for disposal characteristics would be useful in explaining to the consumer and the waste handler how those products are best handled, recycled, or disposed.

Minimize the Volume of Municipal Solid Waste Discards

-Manufacture of Products-

Minimizing the volume of municipal solid waste discards will help slow or reverse the trend of increasing waste generation, thereby changing "business as usual" in our society's garbage habits. Where practical, products, containers, and packaging should be made with less material. Thus, in developing products, manufacturers should consider the amount of waste generated in the disposal of their products and packaging, and should look for ways to reduce those wastes.

By slowing the rate at which products are discarded, waste handling and disposal capacity can be extended. Slowing the rate of generation of discards can be done by using products with longer useful lives, or that are reusable, repairable or can be remanufactured. For example, if the average consumer throws away only 16 tires in his/her lifetime instead of 32, then the amount of tires in the landfill, incinerator, or tire pile is decreased by a factor of two. With approximately 220 million tires being discarded every year and 2 to 3 billion tires already stockpiled in potentially harmful monstrous heaps, this reduction in waste generation could have a tremendous impact. In designing products, manufacturers should consider whether the products, containers, and packages have longer lives, are reusable, or can be composted, in order to reduce the amount of waste that is generated.

States have shown interest in economic incentives, including taxes, tax credits, and charges, and regulatory approaches to promote source reduction activities such as minimizing toxicity and volume of municipal solid waste. Although economic incentives and regulatory approaches may be useful in the future, EPA is not recommending their adoption at this time. Rather, EPA believes that these potentially useful tools require further assessment. For example, the Agency will assess the efficiency of State and local charges and taxes in reducing both the volume and toxicity of the waste. These charges, either fixed or variable, can be assessed at any transaction point from the manufacture of raw virgin materials through final disposal. There are a number of factors influencing the efficacy of a charge program that EPA will examine, including the ability of industry and the public to respond to the fees, the ease of assessing and collecting the charges, and the extent to which such charges change behavior. The study also will examine the use of economic incentives to promote source reduction.

To spur corporate involvement, a corporate recognition program is planned for companies and industries that have succeeded in reducing the volume and/or toxicity of materials used in their products. In addition, meetings between the chief executive officers of corporations and EPA senior officials will be conducted in order to educate corporate policy makers to source reduction, recycling and other waste management issues.

Organizing "Design for Effective Waste Management" workshops with design and packaging engineers, manufacturers, retailers, wholesalers and distributors and EPA can help build consideration of the waste management characteristics of their product into the corporate design and manufacturing process. Many factors are considered in design and manufacturing products; the Agency simply wants the waste management characteristics to be a part of that consideration whenever practical. Some of these workshops would target professors of industrial design, to promote the use of safe and effective waste management characteristics in the engineering design curricula.

-Waste Audits-

Businesses should conduct source reduction audits to find ways in which operations could be altered to generate less or to reuse wastes, including any nonhazardous solid process wastes that are entering the municipal solid waste stream. For example, audits could suggest ways to reduce or reuse office and computer paper, to compost yard wastes generated by landscaping and construction companies, and reuse or recycle any process trimmings (e.g., leather, rubber, plastic, paper, wood) that are handled in the municipal solid waste stream.

-Backyard Composting-

Backyard composting can be a significant source reduction technique by reducing the amount of waste that must be collected and managed. (Compostable waste that must be managed by a waste handler or recycler in a central composting facility can be considered a form of recycling, whereas backyard composting can be considered reuse of a material and therefore a type of source reduction activity. The distinction is rather arbitrary, and thus is only for the purpose of discussion.) Public educational materials, school presentations, and workshops can encourage backyard composting of food and yard wastes by the homeowner. In addition, banning yard waste from landfills and incinerators may provide a local incentive for composting.

Increase Procurement of Products and Packages with Source Reduction Attributes

By purchasing products that have source reduction attributes (less toxic materials, less volume of material per unit product, longer useful life), corporations and government can provide a leadership role for source reduction. Procurement helps to stimulate awareness of markets for these goods, which may provide incentives to industry to increase manufacture of these products and to phase out products that do not meet these specifications for source reduction.

Investigate Potential and Ongoing Source Reduction Policies and Activities

Because source reduction is a relatively new and difficult handling practice for municipal solid waste,* source reduction policies must be fully evaluated to determine the efficacy and impacts. For example, a study could be done of the actual reduction of waste in a household when purchasing habits are altered in favor of products designed for source reduction. Or, a pilot source reduction audit program for businesses could measure the results of source reduction efforts on the waste generated. Other areas of interest include:

- o The use of photodegradable (degraded by sunlight) and biodegradable products and their impact on the environment and their success in alleviating solid waste and litter problems
- o A database of source reduction related activities, including educational and legislative initiatives occurring in the United States and abroad (also examining the reasons these activities were undertaken and their degree of success)
- o The effectiveness of programs that use fees to create incentives for households and businesses to reduce the quantity of waste they produce (including the effects on illegal dumping).

*Some progress has been made in "waste minimization" or "source reduction" of industrial process waste (both hazardous and nonhazardous waste). Source reduction for municipal solid waste presents different issues and problems and few activities have been undertaken

Summary of Participants in Increasing Source Reduction Activities

Obviously the most important participants in increasing source reduction activities are the manufacturing and design industries. They can assume a corporate leadership role in the United States to produce products that have less toxicity, generate less waste, have longer useful life spans, are reusable, repairable, or have other qualities that enhance waste management. In addition, trade associations should hold conferences and workshops for member companies focusing on design for effective waste management.

Federal action to require removal of known toxic constituents from products may be necessary. In addition, Federal action may be necessary to ensure that manufacturers test these products and materials for their potential to release toxic constituents when landfilled, combusted, or recycled. EPA will evaluate the use of the Toxic Substances Control Act (TSCA), as well as investigate broader legislative mandates for authority for these requirements.

EPA will work with the Department of Commerce and other agencies to investigate methods for stimulating industry to produce products with source reduction attributes. For example, a corporate recognition program which would spotlight manufacturers, businesses, and industries which engage in source reduction activities (e.g., minimizing waste volume and toxics generated) will be examined. In addition, EPA will conduct studies on current State and community incentive policies on degradable plastics and other waste materials. (A study on biodegradable plastics has begun already, along with information developed for a report by the General Accounting Office and EPA's Report to Congress on Plastics).

Industry, all government (Federal, State, and local) and the public should purchase products that minimize waste, are less toxic, last longer, or can be repaired or remanufactured. In the Federal government, EPA will be exploring, with the General Services Administration and other Federal Agencies, appropriate mechanisms to accomplish this goal.

TABLE 3.
NEXT STEPS FOR EPA TO ENCOURAGE INCREASED
SOURCE REDUCTION ACTIVITIES

Minimize Toxic Constituents and Materials in Waste

Determine which products, if any, are sources of lead and cadmium	SEPTEMBER 1988
Determine any suitable substitutes for lead and cadmium	MARCH 1989
Evaluate regulatory and nonregulatory options for lead and cadmium	SEPTEMBER 1989
Investigate other toxic constituents in products	MARCH 1989
Evaluate need for Federal testing guidelines	SEPTEMBER 1989

Minimize the Amount of Waste Generated

Study on economic incentives	DECEMBER 1989
Corporate recognition program	DECEMBER 1989
EPA official meet with chief executive officers	NOVEMBER 1988
Design for effective waste management workshops	DECEMBER 1989
Hold conference with industrial design educators	DECEMBER 1989

Increase Procurement of Products With Source Reduction Attributes

Form Federal Task Group to study procurement (same group as for procurement of recycled products)	NOVEMBER 1988
Study of possible changes in procurement policies	SEPTEMBER 1989

Study Ongoing or Potential Source Reduction Policies

Degradable Plastic Study by General Accounting Office	SEPTEMBER 1989
Design database for tracking source reduction policies	MARCH 1989

TABLE 3. (Continued)

**NEXT STEPS FOR EPA TO ENCOURAGE INCREASED
SOURCE REDUCTION ACTIVITIES**

EPA Report to Congress on Plastics	JUNE	1989
Implement database on source reduction policies	DECEMBER	1989
Conduct user fee study	NOVEMBER	1989

IV. OBJECTIVE: INCREASE RECYCLING

Recycling waste materials diverts potentially large volumes of wastes from landfills and incinerators. Thus, recycling is absolutely vital to achieving local and national goals. Recycling is also important because it stops unnecessary depletion of valuable natural resources. Finally, recycling is an excellent educational tool to raise awareness in individuals of all types of waste management, because everyone must become conscious of what they do and do not discard. In order to increase recycling, markets must be available, more recyclables need to be separated, collected and marketed, a National Recycling Council should be formed, incentives and disincentives for safe recycling should be examined, and waste exchanges should be promoted.

One of the many impediments to more recycling is the wide fluctuation of market availability for many secondary materials.

Stimulate Markets for Secondary Materials

One of the major impediments to more recycling is the wide fluctuation of market availability for many secondary materials. We need to stabilize both markets and supply so that they complement one another. Because recycling is often driven by demand, we need to stimulate the demand for these secondary materials to help avoid gluts in the marketplace and to coax change in our current industrial infrastructure. A variety of actions may result in market growth. These include the promotion of the procurement of recycled goods; market development studies for numerous commodities; nonprofit regional market information councils; procurement guidelines for recycled products; better separation and collection of plastics and lead-acid batteries; a National Recycling Council; studying liability disincentives and incentives; and waste exchanges.

Establish Incentives

States, including economic development agencies, have shown interest in tax credits and loans for industries using or processing secondary materials, or purchasing recycled goods as incentives for increasing these practices, thereby stimulating and stabilizing markets. Incentives must be targeted carefully to have a real impact. State and local incentives could include tax credits (including property taxes) and other fees in order to encourage existing industries to use secondary materials in the manufacture of products, or to lure secondary materials industries to communities that lack markets for their collected recyclables. Similar tax incentives could be used for industries and businesses that purchase recycled goods, as these companies are promoting stable final markets. Other incentives include low-interest loans for construction or expansion of secondary materials industries, and for businesses that purchase recycled goods. These economic incentives may be instrumental in changing individual and corporate behavior and will be included in the study on economic incentives noted earlier in the section on source reduction.

Each level of government should seek to identify and delineate economic disincentives to processing or purchasing secondary materials. Although many comprehensive analyses were done in the 1970's, tax laws and the economy have changed in the intervening years, creating a need to update our information.

Freight rates and other transportation issues are often cited as significant disincentives to procuring secondary materials. Given that transportation laws and policies have changed since the 1970's (when extensive studies were done), EPA will work with the Interstate Commerce Commission and the Department of Transportation to investigate whether transportation issues significantly affect the marketing of secondary materials, and whether changes to these policies are necessary to remove disincentives to creating stable markets.

A market development study would be valuable in determining the regional, national, and international growth potential for the secondary (waste) paper market.

These studies, done at the State, regional, or Federal level, should evaluate ways to expand paper markets on a level concomitant with increased collection and separation of waste paper. EPA will conduct such a study, as well as similar studies on compost and lead-acid batteries. Market development studies for other secondary materials would identify ways to stimulate markets for these commodities. All market development studies should solicit input from the existing local and national secondary materials markets.

-Create Regional Market Councils-

Development of nonprofit regional market information councils can enhance communication among States and between localities so as to improve marketing and information-sharing regarding secondary materials and compost. To be effective, these councils must build on the existing markets and networks in their region. Such organizations can match markets with sellers and provide information on the amount and type of processing necessary, the long-term availability of the market, and the volumes that the market will bear. In addition, regional market councils can study regional market development and institute policies to enhance or stabilize markets. Membership in such an organization should include representatives from the waste management, manufacturing, and secondary materials industries, States, and public interest groups.

-More Procurement of Recycled Goods-

Procurement of recycled goods is an important way to stimulate final markets for recycled products. Organizations that purchase large amounts of products, such as governments, corporations and industry, can be especially helpful in stimulating markets. Purchases of recycled goods by consumers provide a clear signal to the manufacturing industry to produce and advertise recycled products.

Governments and corporations should issue procurement guidelines for recycled goods. Candidate products include numerous papers (office, computer, newsprint, corrugated, tissue), glass, plastic, compost, aluminum, steel, oil, tires, batteries,

etc. For example, the Federal government will study whether procurement guidelines should be issued for materials in addition to the ones currently being issued for paper, re-refined oils, tires, and insulation materials. One example would be used automotive parts, or remanufactured engines or electronics. All levels of government could procure compost for use along roads and in landscaping public lands. EPA and GSA will form a working group with other Federal agencies to develop education and implementation programs for existing, planned, and potential guidelines in Federal agencies.

Compost from processed food and yard waste, municipal waste, and co-composted municipal solid waste and sewage sludge is often difficult to market due to the fluctuating quality of the compost and variable metals content. Quality standards for compost products will provide national consistency and will assure the potential compost buyer that the product will perform safely and adequately. Such standards could include different "grades" of compost suitable for different purposes or that perform differently.

Better Separation and Collection of Materials

To reach a goal of increased recycling, more materials need to be separated, collected, processed, marketed and manufactured into new products. We have discussed ways to stimulate the two final steps (marketing, manufacture) of recycling, but we also need to stimulate the first three steps.

-Local Programs-

Collection, separation, and processing are essentially local issues, and as such, will not be discussed in detail in this report. In general, the more convenient collection is for the waste generator and for the waste handler, the higher the participation rate and amount of materials collected.

Many communities and States have devised successful mandatory or voluntary collection and separation programs. Again, the issue of mandatory versus voluntary programs is a local or State issue, depending on the community's or State's needs. Other local aspects of collection include the design of an education program and choosing among curbside pickup, drop-off centers, and materials recovery facilities. Local recycling coordinators can contribute significantly to the success of recycling programs. Training of these coordinators in education, collection, processing and marketing is therefore very important. EPA will generate guidance on training of recycling coordinators.

Special Recyclables

Two commodities currently are difficult to collect and/or process, but may be beneficial to recycle--plastics and lead-acid batteries.

Plastics are promising materials for increased recovery and recycling; however, collection and separation of different types of plastic are difficult, and hamper current recycling efforts. The voluntary coding of plastic types undertaken by the plastics industry is a helpful first step. Until plastic collection is substantially improved, recycling of plastics will continue to lag. Industry should step up its study of the problems and options for collection of plastics for recycling.

Lead-acid batteries are a problem to collect, process and dispose of. Although many are recycled, a significant number are not. Many battery recyclers are closing their doors, and many retailers and auto shops will not accept used batteries from the consumer. We must avoid potential risk to human health and the environment from the lead and acid in these uncollected (and possibly mismanaged) batteries. Regulatory and nonregulatory options for recovery of lead-acid batteries, including a mandatory "buy-back" by manufacturers will be investigated to find practical ways to collect them for safe recycling.

Establish a National Recycling Council

A national advisory council on recycling policies should be formed, comprised of representatives from the secondary materials and waste management industries, public interest groups, States and regional marketing cooperatives. This council would stay abreast of technical, regulatory, and legislative policies and initiatives that can enhance or hamper recycling efforts. The advisory council would also measure national progress in attaining goals of increased recycling. In addition, a national council can explore international markets for secondary materials and study world trends. This council should obtain funding through its membership.

Examine Incentives and Disincentives For Safe Recycling

Industry has argued that potential liability under Superfund may inhibit the secondary materials and recycling industries from recycling materials such as lead-acid batteries, household hazardous waste, used oil, autos, and white goods (refrigerators, etc.). These secondary materials and recycling facilities may be liable because of the potentially toxic byproducts of processing, including lead and cadmium, and polychlorinated biphenyls (PCB's).

Potential liability may provide a disincentive for persons to operate a recycling facility, but also provides an important incentive for persons to properly manage their wastes. EPA should review the incentives and disincentives affecting these industries and determine ways to increase incentives for persons to operate such facilities while ensuring that they properly manage their secondary materials and wastes.

Industrial and Commercial Waste Exchanges

High volume homogeneous industrial or commercial wastes should be reused and recycled to the highest degree possible. As noted previously, these nonhazardous solid wastes can often end up as municipal solid waste, taking up valuable landfill

capacity or disturbing operations at a combustion facility. Waste exchanges are an important way to relay these wastes from the point of generation to the market. In addition, these waste exchanges can often save companies significant costs in disposal. Many regional waste exchanges exist already. Communities and industries should access these existing networks or form new exchanges for their areas.

Summary of Participants in Increasing Recycling

-Participants for Stimulating Markets-

Economic incentives and disincentives should be reviewed by all levels of government and industry. EPA will update previous studies on economic factors, including transportation disincentives to recycling and potential economic incentives for industries processing or using secondary materials and for industries that purchase recycled goods.

Market studies for secondary materials should be done by industry and all levels of government. EPA will focus initially on paper, compost, and lead-acid batteries.

Industry should convert manufacturing processes to utilize secondary materials to a much greater extent, in order to stimulate secondary materials markets.

Everyone should purchase recycled goods. A Federal working group, made up of representatives from EPA, the General Services Administration, the Department of Defense, and other Federal agencies, will be organized to encourage Federal agencies to procure recycled goods and compost (e.g., National Park Service), and study how procurement of these goods may affect operations within the agencies. EPA has issued procurement guidelines for some commodities, including paper and tires, and is developing guidelines for others. The working group will also formulate ways for agencies to enforce procurement guidelines, to ensure that proper purchasing is occurring.

-Participants in More Separation and Collection-

All levels of government should consider the merits of mandatory separation and collection of recyclables. An interagency working group will be convened to study the feasibility of a comprehensive separation and collection program for Federal Agencies. A model program to educate employees and encourage participation in paper recycling is under development by EPA.

Recycling in communities should be publicized by local governments and the waste management industry through the news media, schools, workshops, etc. The secondary materials industries should publicize their availability and existing network to the public and local government and should examine ways to expand their role in community recycling.

Industry working with government should continue to investigate ways to collect more plastics, while the Federal Government will investigate systems for collecting batteries. EPA will study how batteries are currently handled, evaluate the optimal waste management methods for these used batteries (including the multimedia impacts of these alternative), and evaluate the regulatory and nonregulatory options for promoting better management of batteries (e.g., mandatory "buyback"). Use of the Toxic Substances Control Act will be investigated.

-Participants in Waste Exchanges-

States and industry should distribute information on existing waste exchanges through regional marketing councils and should assist local governments and industries in matching waste donors with recipients.

Municipalities and the waste management industry should characterize their waste streams and meet with the industries that contribute their solid wastes to the municipal solid waste stream. Local governments and waste handlers should develop waste exchanges and work with the industries at hand to find markets or uses for this waste.

TABLE 4.
NEXT STEPS FOR EPA TO PARTICIPATE IN AND
ENCOURAGE INCREASED RECYCLING

Stimulate Markets for Secondary Materials

Study on existing economic and transportation disincentives to recycling	MAY	1989
Study on potential recycling incentives to encourage recycling	DECEMBER	1989
Market development study for paper	JULY	1989
Market development study for compost	JUNE	1989
Market development study for used lead-acid batteries	JUNE	1989
Form Federal Task Group for Implementing procurement	NOVEMBER	1988
Recommendations from Federal Task Group on procurement	OCTOBER	1989
Final tire procurement guidelines	NOVEMBER	1988
Final insulation materials procurement guidelines	FEBRUARY	1989
Final compost procurement guidelines	SEPTEMBER	1989
Study on procurement of other materials.	FEBRUARY	1989

Increase Separation, Collection and Recycling of Waste

Model training program for recycling coordinators	NOVEMBER	1989
Study on regulatory, non-regulatory options for batteries	JULY	1989
Form Interagency workgroup on recycling and separation in Federal agencies	SEPTEMBER	1988
Model education program for Federal agencies	JUNE	1989

TABLE 4. (Continued)

**NEXT STEPS FOR EPA TO PARTICIPATE IN AND
ENCOURAGE INCREASED RECYCLING**

National Recycling Council

Facilitate the formation of the National Council JANUARY 1989

Study Incentives and Disincentive of Liability

Case studies on first commodity MARCH 1989

V. OBJECTIVE: REDUCE RISKS OF COMBUSTION

Incineration of waste can be a viable waste management alternative for many communities. To increase the viability of this option, it is important to ensure that

Incineration of waste can be a viable waste management alternative if it is designed, operated, and controlled to minimize risks to human health and the environment.

incinerators are designed, operated, and controlled to minimize risks to human health and the environment from both air emissions and ash. Options for improving the safety of incineration include upgrading incinerator performance standards, increasing education and technical assistance, establishing operator training and certification programs, and evaluating potential bans on incineration of some types of waste.

Upgrade Incinerator Performance Standards and Ash Management

-Air Emissions-

The establishment of appropriate performance standards for incinerators serves several purposes, including protection of human health and the environment, consistency and efficiency in the design and operation of incinerators, and increased public confidence in the safety of incinerators. Standards for particulate matter control from incinerators were initially established in the 1970's. Since then, pollution control technologies applicable to incinerators have improved significantly.

Considering these technological improvements and other information compiled during the EPA's comprehensive study of municipal waste incineration, EPA issued an Advanced Notice of Proposed Rulemaking (ANPR) announcing intentions to revise standards for incinerators. EPA plans to issue both performance standards for new sources and guidelines for States to use in considering additional control requirements for existing sources. These regulatory requirements for new and existing

incinerators should ensure that the public health and environment are protected through the application of the best system of control technologies available considering cost, energy requirements, and other environmental considerations.

The current schedule calls for the new source standards and existing source guidelines to be proposed in November 1989 and promulgated in December 1990. In the interim, EPA has already taken steps to ensure that new sources install the best available control technologies. In June 1987, EPA issued guidance to new source review permitting authorities that established the presumption that best available control technologies for incinerators include dry scrubbers, efficient particulate control equipment, and good combustion practices. A recent survey of affected sources demonstrated one hundred percent compliance with the June 1987 guidance.

-Ash Management-

No incinerator should be built without a plan for management of the residual ash. Such plans might include dedicated landfill cells with special pollution controls, stabilization, or contracts for recycling the ash for use in roadbeds or as soil amendments (if tests indicate that the ash would be safe for amending soil). Local government should require a plan for safe and effective ash management when contracting for a combustion facility.

Education and Technical Assistance

Education and technical assistance regarding the combustion of municipal solid waste are important in increasing the safety and effectiveness of incineration. Citizens who are more educated about the design and operation of incinerators can better assist in the planning for local waste management, and may be more willing to site properly designed and operated incinerators. Operators of combustion facilities as well as local government can use technical assistance offered by the Federal

government and industry in order to ensure safe and effective incineration of the waste.

All levels of government (local, State, Tribal, and Federal) need to educate their citizens about the risks and benefits of municipal solid waste incineration, in addition to the other issues mentioned previously in this report. Local governments need to involve citizens in the decision-making process. Citizens want to know about the risks that they may be assuming in siting a facility in their neighborhood. A useful primer would be one that describes the strengths and weaknesses of risk assessment, how a generic risk assessment of an incinerator would be conducted, and the local factors that affect the risk level (such a primer also would be applicable to landfills).

Operator Certification

Operator training and certification programs can help ensure safe and effective operation of the incinerator and pollution control equipment. Issues that need to be resolved concerning training and certification include: which level of government should establish training and certification requirements, which specific incinerator plant personnel should be trained and/or certified, how frequently certification should be renewed, and others.

Some States have already initiated training and certification programs. EPA has maintained close contact both with these States and with the American Society of Mechanical Engineers (ASME) during ASME's ongoing efforts to develop a model incinerator training and certification program. Although States and/or local governments are best suited to actually administer such programs, EPA will be considering the value of establishing model operator training and certification standards during the development of the regulatory program for new and existing incinerators.

Banning Particular Wastes from Incinerators

Existing data indicate that certain waste materials contribute relatively significant amounts of hazardous constituents to emissions and ash (especially toxic organics and heavy metals). However, data are currently inadequate to determine precisely the effect on air emissions and ash of eliminating specific materials from the waste stream prior to incineration. EPA has initiated studies of certain waste materials to allow for the evaluation of potential bans on specific waste stream constituents. EPA studies are initially focused on potential sources of lead and cadmium. The studies should also determine the effects on incinerator efficiency (Btu values) if certain wastes are banned, and whether such bans can be adequately enforced.

Despite the current paucity of data, individual governments at the State and local level may wish to consider banning specific waste materials from existing or planned incinerators for various reasons. For example, a municipality struggling to initiate an effective yard waste composting program may find that banning yard wastes from incineration may increase composting rates. Such yard waste bans may also improve combustion of the rest of the waste stream by reducing moisture content and ensuring more consistent Btu values through the seasons. Local governments considering bans of certain wastes from incinerators should ensure that sufficient capacity is available to handle the banned waste, and that the management option for the banned waste does not pose significant risk to human health and the environment.

Incinerator Permits

Some States and communities have a policy of issuing incinerator permits only when the incinerator was planned as part of an overall evaluation of integrated waste management, including recycling. Thus, waste managers and planners would have to at least consider the practicality of establishing a recycling and/or composting program. Such practices can help to prevent reliance on "single solutions" and promote the concepts and practices of integrated waste management. Other communities should

consider such action in order to leverage consideration of recycling programs and ensure proper planning.

TABLE 5.
NEXT STEPS FOR EPA TO HELP REDUCE THE RISKS OF COMBUSTION

Upgrade Incinerator Performance Standards and Ash Management

Proposed air emission standards	NOVEMBER 1989
Final air emission standards	DECEMBER 1990

Increase Education and Technical Assistance

Development of a primer on risk assessments	NOVEMBER 1989
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Operator Certification

Resolve issues	JUNE 1989
Decide whether to develop a model operator certification program	NOVEMBER 1989

Bans on Materials from Incinerators

Report on lead and cadmium materials completed	SEPTEMBER 1988
Collect data on other materials	DECEMBER 1989

VI. OBJECTIVE: REDUCE RISKS OF LANDFILLS

Municipal solid waste landfills are used to dispose of the majority of our nation's municipal solid waste, and will continue to be essential in the future. Although increased source reduction and recycling will reduce the volumes of waste going to landfills, and may make some waste more benign, we must increase the safety of landfills to ensure protection of human health and the environment, as well as public support when new ones must be sited. Operator certification, minimum design and operation standards, education and technical assistance, and studies on potential bans of some wastes from landfills all contribute to reaching the goal of increased safety and reduced volumes of waste needing landfilling.

Operator Certification

Properly designed and operated landfills require knowledgeable operators in order to ensure efficient and safe compaction of waste without damage to liners, leachate collection systems, or other design features. In addition, the monitoring required at municipal landfills requires an experienced operator. Certification of operators can help ensure that experienced operators run the facilities and equipment. Increasing the safety and effectiveness of landfill operations through certification can help prevent problems endangering human health and the environment, can increase public confidence, and can extend precious landfill capacity.

Municipal solid waste landfills are used to dispose of the majority of our nation's municipal solid waste, and will continue to be essential in the future.

Any certification of landfill operators should occur through State programs or through programs developed by trade and industry associations. EPA is planning to provide guidance on certification to States that want to develop and implement a

certification program. These programs could work similarly to the programs for incinerator operator certification.

Increase Design and Operation Standards and Guidance

Minimum standards for the design and operation of landfills are critical for ensuring protection of human health and the environment over both the short and long term. Properly designed and operated landfills should provide safe disposal of waste, but do not efficiently reduce the bulk or toxicity of the waste. Thus, waste disposed in landfills degrades very slowly and safe design and operation throughout the life of the landfill is crucial.

Minimum standards for design and operation of landfills exist at both the Federal and State level. Revised minimum standards for design, operation, and location of landfills, including monitoring, closure and corrective action requirements are already underway at EPA in response to requirements under the Hazardous and Solid Waste Amendments of 1984. These standards will help to prevent future problems with releases of toxic constituents to ground and surface waters. Remedial action for existing and/or closed landfills that are posing potential threats to human health and the environment is also important. States must adopt and enforce these standards in order to ensure safe and effective operation of landfills. Many States have already developed stringent standards for operation and design of landfills.

EPA has also been developing air emission standards for new and existing landfills under the Clean Air Act to control emissions of volatile organic compounds that create an odor nuisance as well as a potential hazard to human health and the environment.

Education and Technical Assistance

Education and technical assistance by all levels of government and industry can decrease the risks posed by landfilling, upgrade design and operation, and increase public confidence in the management practice.

There is ongoing debate about the landfill characteristics which are best for managing municipal solid waste. This debate is concerned with whether a landfill should be "dry" (to prevent any leaching of hazardous constituents) or "wet" (to promote degradation at a higher rate). EPA will sponsor a technical conference of experts and engineers to further discuss this question, and any research necessary in the area.

As mentioned earlier in the section on incineration, education about risk assessments is important for everyone to know the benefits and limitations of risk assessments done on landfills. The primer of risk assessment which was described earlier will include a discussion on landfills.

Bans on Certain Wastes from Landfills

evaluated to ensure that this alternate management practice has sufficient current or future capacity and poses fewer risks than landfilling. For example, States and municipalities should ensure that composting facilities have adequate capacity to handle a large influx of yard waste which may have been banned from the landfill, or that new composting facilities will be built.

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As mentioned earlier in the section on incineration, education about risk assessments is important for everyone to know the benefits and limitations of risk assessments done on landfills. The primer of risk assessment which was described earlier will include a discussion on landfills.

Bans on Certain Wastes from Landfills

It may be desirable to ban certain wastes from landfills in order to increase the safety and effective management of the the landfill and leachate collection system. Some wastes may be "bad actors" by contributing hazardous constituents to landfill leachate, producing explosive levels of methane gas, toxic air emissions, or differential settlement due to uneven compaction.

What wastes, if any, should be banned from landfills should be studied by the Federal government, States and municipalities. Such an evaluation would be similar to the one on incinerators and could include materials like oil, household hazardous waste, batteries, tires, and yard waste. States and EPA should also study the effect on methane gas production of banning yard wastes from landfills. For any proposed bans, the management practice that would take the place of landfilling should be

evaluated to ensure that this alternate management practice has sufficient current or future capacity and poses fewer risks than landfilling. For example, States and municipalities should ensure that composting facilities have adequate capacity to handle a large influx of yard waste which may have been banned from the landfill, or that new composting facilities will be built.

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TABLE 6

NEXT STEPS FOR EPA TO HELP REDUCE THE RISKS OF LANDFILLING

Operator certification

Resolve issues related to certification	DECEMBER	1988
Guidance on certification available	JUNE	1989

Design and operation standards

Propose revised minimum criteria for landfills	AUGUST	1988
Issue final criteria	DECEMBER	1989
Air emission standards proposed	NOVEMBER	1988
Final air emission standards	DECEMBER	1990

Education and Technical Assistance

Primer on risk assessment (same effort as for incinerators)	NOVEMBER	1989
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Bans on Materials from landfilling

Identify materials to be studied	DECEMBER	1988
Finish data collection	DECEMBER	1989
Issue a report on findings	MAY	1990

CONCLUSION

Our nation has choices as to how we are going to deal with our ever-growing garbage problem. We can continue to create more and more garbage, or we can cut back. We can continue to bury most of our waste, or we can find feasible ways to recycle more of it. We can design products and packaging without considering disposal or we can design for source reduction and recycling. We can wait for local crises to occur or we can plan now to avoid them. In short, we can ignore the issue and hope it goes away, which it will not, or we can act now to deal with it. But whether we like it or not, our garbage is no longer "out of sight and out of mind."

The Agenda for Action establishes a "game plan" for addressing our garbage problem which underscores the need for an effective integrated waste management approach, including source reduction, recycling, incineration, and landfilling. It is not a panacea, but the Agency believes that its implementation will go a long way toward safely eliminating the gap between the generation of garbage and our capacity to handle it, as well as provide for waste management that protects both human health and the environment.

